DOCUMENT RESUME

ED 190 115 IR 008 600

AUTHOR Kurfiss, Joanne
TITLE Coping with the Concrete Learner in the College Classroom.
PUB DATE 24 Apr 80
NOTE 11p.: Paper presented at the Annual Convention of the Association for Educational Communications and Technology (Denver, CO, April 24, 1980).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Cognitive Processes; *College Students; *Concept Formation; *Concept Teaching; Higher Education; *Learning Processes; Learning Theories; State of the Art Reviews; *Teaching Methods
IDENTIFIERS Piagetian Theory

ABSTRACT

Two ways in which the college teacher accustomed to formal thought and formal teaching can reach students who are more adept at concrete learning are suggested. Guidelines are provided for the first method, which entails the incorporation of activities and materials into the regular lecture or lecture-discussion format of the class. The second, which is called the Learning Cycle, takes advantage of the model developed by Robert Karplus to teach particularly difficult concepts. This model is based on two assumptions of Piaget's theory of development-concrete experience helps people learn, and experiences that optimally challenge existing beliefs about the world are inherently motivating to the learner. A brief discussion of this model includes an example of a learning cycle and its creative possibilities. Tables provide data on concrete, transitional, and formal thinking in college students; an outline of anticipated responses of concrete learners to some formal task requirements; a summary of the learning cycle model; and guidelines for assisting the concrete learner. A brief list of references and suggested readings is attached. (FM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED190115

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

COPING WITH THE CONCRETE LEARNER IN THE COLLEGE CLASSROOM

by

Joanne Kurfiss

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Joanne Kurfiss

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

IR008600

COPING WITH THE CONCRETE LEARNER IN THE COLLEGE CLASSROOM

Joanne Kurfiss, Ph.D.
Instructional Development
Weber State College
Ogden, Utah

All of us who teach have had the experience of being unable to "reach" certain students. We may attribute the difficulties to student motivation, student inability, or an undefined deficiency in our teaching methods. Depending on our degree of caring, our time and knowledge resources, and our current frustration level we seek ways to remedy the situation. Most often we are still left with a residual group of students who never really seem to master the concepts or methods we seek to convey. And as a rule we accept this as a fact of academic life, having something to do with the familiar (and comforting) notion that intellectual ability (whatever that may be) is "normally distributed" among "the population."

Lest you anticipate yet another diatribe against normative grading, let me hasten to state my contention: We are facing a kind of intellectual stagnation that is the end product of years of mental inaction on the part of our students. It's not that they are not bright; it's just that they've often not learned to "think" in the context of academic subjects. Active thinking is prerequisite to management of the abstractions students experience in college. To the degree that memorization suffices, students will memorize, but as the task demands more reorganization and integration of information and ideas, their strategy of memorizing will fail them, and they will indeed appear (and often feel) "dumb." Concepts which seem simple and fundamental to us as instructors often require intellectual gymnastics far beyond what students are capable of. We need to develop a healthy respect for the underlying complexity of principles that seem, on the face, to be readily understandable yet require mental activity which students are unaccustomed or unable to perform.

But what do we mean by "active thinking" or "mental activity?" Is not memorization an active (and important) mental process? Indeed it is, and has been the subject of extensive psychological investigation since Ebbinghaus' research in the late 1800's. However, the work of Jean Piaget has uncovered numerous other mental activities (he calls them "operations") and has provided extensive descriptions of their properties. The most important properties for our purpose are that mental operations:

1. Change and evolve with age, moving from inflexible, specific, and simple to flexible, generalizable and complex;

2. They require active, real world experience ("concrete" in Piaget's terms) in the manipulation of objects and events in order to reach their full expression;

3. They develop in response to the need to "make sense" of experience; and

4. Once the age and experience requirements are satisfied, the operations can "go underground;" that is, the thinker can think without the benefit of tangible objects as referents or potential referents.

Piaget thinks of this latter ability in terms of a "stage" of development, termed "formal operations" since the form, rather than the concrete reality, of a proposition or event is what directs thought. In the previous stage, concrete operations, the child can only reason about "real" things and their relationships; never about abstractions, hypothetical cases, or general laws.

Piaget devised numerous tests to determine how fully developed these operations had become for any individual. In his initial work on formal operations, he found 16 year-olds with well developed abilities. (Inhelder and Piaget, 1958) However, recent research indicates that in a variety of college student samples, formal operational thought is the exception rather than the rule (see Table I). Nonetheless, since most college faculty are formal thinkers, and probably have been since high school, and since most of us were taught by formal thinkers and did quite well under that approach, we tend to assume that our students have formal abilities, and we teach accordingly. As you read this, you are probably using formal abilities. You are, for example, understanding abstract concepts (I have so far given very few "concrete" examples). You are no doubt comparing your understanding to previous theories and beliefs about students. You may be making evaluative judgments (possibly thinking that your students are not like this!). Or you may be instantaneously grasping the implications of these ideas, recalling examples from your own teaching and learning experiences, and recognizing the power of this reconceptualization of what students are doing--all from a mere fragment of information.

To assist the reader in grasping the concept of a concrete-formal distinction, a list of formal tasks and concrete responses is presented in Table 2.[1] In addition, the bibliography will suggest some further readings on the subject.

How can the college teacher, accustomed as she is to formal thought and formal teaching, bridge the gap and help students learn--without sacrificing the integrity of the material? One way is to incorporate activities and materials into the regular lecture or lecture-discussion format of the class (see Table 3). Another is to take advantage of the model developed by Robert Karplus (1974) to teach particularly difficult concepts. The model is called the Learning Cycle; some of you may recognize parallels to the "inquiry method" used in science teaching for many years. The Learning Cycle is based on two assumptions of Piaget's theory of development:

1. Concrete experience helps people learn; and

2. Experiences that optimally challenge existing beliefs about the world are inherently motivating to the learner.

---

[1] In the workshop, an activity designed to dramatize the differences and enable participants to observe them firsthand will be used to supplement the table.

TABLE 1

CONCRETE, TRANSITIONAL, AND FORMAL THINKING IN COLLEGE STUDENTS[a]

Investigator(s)	Number of Students	Level of Students	% Concrete	% Trans.	% Formal
Arlin (1975)	60	Soph.		48[b]	52
Elkind (1962)	240	n.d.		42	58
MacKinnon & Renner (1971)	131	Fresh.	50	25	25
Pitt (1976)	14	Junior	15	14	71
Renner & Lawson (1973)	185	Fresh.		58	42[c]
				28	72[d]
Schwebel (1972)	58	Fresh.		17	83
Tomlinson-Keasey (1972)	n.d.	Mixed	10	23	67
Tomlinson-Keasey & Keasey (1974)	24	Mixed	8	22	70
Towler & Wheatley (1971)	71	n.d.		39	61
Weber State College (1979)	51	Fresh.	27	57	16
Provo Technical (1979)	24	Fresh.	13	33	54

[a] All data except those from Weber State and Provo Tech are based on a summary presented in King (1977, pp. 84-46).
[b] Where Concrete and Transitional data are not presented separately, non-formal responses are grouped in the center column.
[c] Using the pendulum task
[d] Using the volume task

TABLE 2

THE CONCRETE LEARNER IN THE CLASSROOM

FORMAL TASK REQUIREMENTS	ANTICIPATED RESPONSE OF CONCRETE LEARNER	NOTES
Learning from predominantly verbal material (oral or written)	May show poor comprehension and retention, especially for very abstract, complex, or unfamiliar material	
Learning about unfamiliar objects or events; abstract concepts, properties, or relationships; axioms, or theories. Understanding metaphoric language, symbolism, or nonverbal behavior	Will interpret literally, focus on surface aspects, attempt to memorize rather than understand. Will be unable to detect underlying meanings, interpret symbols or behavior in context, or relate content to previously learned principles	
Executing lengthy or complex proceudres; planning new procedures based on general principles	Will require detailed, step-by-step instructions; best if illustrated, where feasible. "Guidelines" may not provide sufficient guidance.	
Imagining a point of view different (physically) from one's own; mentally transforming spatial relationships between objects	May require actual movement of self or objects. May perform needed transformations slowly or rely on overt movements representing the transformations required.	
Reasoning about proportional relationships; solving "word problems" involving proportions	May attempt to apply a rote formula and will often confuse the relationships involved as a consequence	
Reasoning about hypothetical situations, possibilities, or probabilities	May dispute the premise, arguing that it is not or could not be thus, so should not be discussed. In probability problems, may insist that one must examine entire population rather than estimate from a sample	

CONCRETE LEARNER

FORMAL TASK REQUIREMENTS	ANTICIPATED RESPONSE OF CONCRETE LEARNER	NOTES
Identifying all possible combinations of three or more objects	Will fail to use any systematic approach or will require prompting to use a previously learned system. May fail to identify full set or may duplicate responses due to lack of systematic approach.	
Reflecting upon one's own reasoning or the reasoning of others; evaluating consistency of an argument or plan; detecting underlying assumptions; taking the (psychological) point of view of another person	Fails to detect inconsistencies among statements or between statements and known facts. Thinks others are "reading between the lines" when they analyze assumptions or evaluate ideas. Has difficulty accepting ideas based on beliefs or experiences different than his/her own.	
Troubleshooting; using experimental method. Formulating hypotheses, selecting observations, and controlling variables to test a hypothesis systematically	May fail to note relevant information or may select irrelevant information to observe. May form confused or irrelevant hypotheses. Confounds variables when testing their effects. Draws invalid conclusions.	
Generalizing previously acquired knowledge to new but related situations	Tends to treat each situation as a totally new type of problem. May seem to have forgotten relevant skills learned in another context. When reminded, may ask (or simply wonder), "What's <u>that</u> got to do with <u>this?</u>"	

TABLE 3

How to Assist the Concrete Learner

Based on an analysis of the concrete learner in the classroom the following guidelines are offered for instructors desiring to adapt learning activities to the needs of their non-formal students. Specific applications will depend on the nature of the material being taught.

1. Provide abundant guided hands on learning experiences with models that can be manipulated or other appropriate equipment or materials.

2. Provide readily visible, accessible demonstrations, as well as opportunities to observe the process in its actual context whenever feasible. The value of these experiences is enhanced by providing explicit prior instructions as to what to look for during the demonstration or field visit, and by pointing out processes or phenomena to be studied as they are observed.

3. Provide frequent opportunities to solve "problems" and make discoveries related to the subject, using the actual materials involved whenever possible. Problem-solving takes many forms, from working a puzzle to getting a computer to run. It also occurs in the context of a well-constructed educational game. A close examination of teaching materials will often reveal a number of places where key concepts can be "discovered" rather than directly taught through reading or lecture. Discovery and problem-solving help the student transcend rote learning, and transfer knowledge to new situations.

4. Use questioning techniques that stimulate application, analysis, synthesis and evaluation as opposed to recall of rote knowledge. Relate questions to ongoing activities of the student. Use "how" and "why" questions frequently. Encourage students to spell out their reasoning processes and to support them with reference to problems, materials, or concepts previously learned.

5. Help the student to make connections between skills and concepts being taught, and to integrate new knowledge with old. Use prompts, cues, and reminders to "jog" the learner's memory. Prepare the student to assimilate related ideas that will appear later in the course.

6. Encourage students to work together to solve problems. This enables them to test and challenge their own and each other's ideas, and heightens interest in achieving solutions.

Prepared by:
Joanne Kurfiss, Ph.D.
Office of Instructional Development
Weber State College
9/28/79

In Piagetian jargon, the latter is referred to as "inducing disequalibrium." The learner is obliged to reconcile old beliefs and new information that may seem at first to contradict the beliefs ("cognitive dissonance" is a more familiar term for much the same process). New and more generalized or integrative concepts are "discovered" or developed by the learner as a consequence of the effort to "make sense" of this contradiction. Table 4 summarizes the Learning Cycle model.[2]

To provide a "concrete example" of a learning cycle, consider a simple exercise designed by Elaine Cohen of Metropolitan State College, used to help students grasp the notion of inferences as opposed to observations. In the Exploration phase, a stranger to the student is asked to stand before the class. The students are asked to describe this person and their ideas are recorded. In the Invention phase, students discuss the basis on which they made their comments. Ideas such as past experience with persons of similar dress, appearance and manner; stereotyping; guessing, and other inferential processes are frequently mentioned. The difference between the basis of the description (e.g. long hair) and the inference from the observation (e.g. involved with drugs) can be brought out in the discussion. In the Application phase, many directions can be taken, depending on the purposes of the lesson. For instance, in a social psychology lesson on attribution theory, the professor may want to have students identify ways in which inferences are used to make attributions. In a literature class the teacher may want to have students consider how a good writer leads the reader to make inferences about characters, using examples the students seek in a book they are reading. In physics, the issue may be to help students understand how the behavior of particles is used to make inferences about the nature of those particles. The reader will hopefully see the uses of such an activity in his or her own discipline.[3]

The creative possibilities of the Learning Cycle are endless. Their use in conveying concepts that are fundamental or critical, as well as those which often seem to be most difficult for students to grasp, will aid the instructor in helping students master the goals and objectives of a unit, course, or program. Judicious use of learning cycles may also enhance student interest in the discipline under study. Where learning cycles are impractical, the guidelines provided in Table 3 can help the teacher in planning instruction that will "reach" the concrete learner. It is advisable when experimenting with this model to explain to students what it is you are trying to accomplish. Students accustomed to being "spoon-fed" are likely to be frustrated at suddenly being unable to capture the answers in their notes so that they can be memorized. A compensating benefit of this approach is that students will be unlikely ever to "forget" concepts they themselves have "discovered" or "invented" from their own experience and questions. Instead, they will find themselves able to generate information or hypotheses derived from their discoveries; in short, they will be "thinking" and enjoying it.

---

[2] In the workshop, participants will be introduced to the concepts of "inducing disequilibrium" and "learning cycles" through a learning cycle activity.

[3] Workshop participants will have an opportunity to create a learning cycle of their own. In addition, Sharon Hahs will discuss problems of implementing learning cycles and answer questions.

TABLE 4

THE LEARNING CYCLE MODEL
(Campbell, et al, 1979)

In applying the Piagetian technique to the classroom, a direct change in emphasis occurs: From the teacher (teacher-centered approach) to the student (student-centered approach). This is accomplished by using a learning model (called the Learning Cycle) which has three distinct and separate parts. Each is outlined below.

1. Exploration

Following a brief statement of topic and direction, students are encouraged to learn through their own experience. Activities may be supplied by the instructor which will help the students recall (and share) past concrete experiences or assimilate new concrete experiences helpful for later invention and/or application activities. During this activity the students receive only minimal guidance from their instructor and explore new ideas spontaneously.

Emphasis - Concrete experience.
Focus - Open-ended student activity.
Function - Student experience is joined with appropriate environmental disequilibrium.

2. Concept Invention

In this phase, the concrete experience provided in the exploration is used as the basis for generalizing a concept, for introducing a principle, or for providing an extension of students' skill or reasoning. Student and instructor roles in this activity may vary depending upon the nature of the content. Generally, students should be asked to "invent" part or all of the relationship for themselves with the instructor supplying encouragement and guidance when needed. This procedure allows for students to "self-regulate" and therefore move toward equilibrium with the concepts introduced.

Emphasis - Generalization of concrete experiences to abstract possibilities.
Focus - Student's active involvement with instructor for generalization.
Function - Student self-regulation and equilibration of generalized concepts and/or skills.

3. Concept Application

The application phase of the Learning Cycle allows each student an opportunity to directly apply the concept or skill learned during the invention activity. This activity allows additional time for accommodation required by students needing more time for equilibration. It also provides additional equilibrating experiences for students who have already accommodated the concepts introduced.

Emphasis - Relevant use of generalized concepts and/or skills.
Focus - Directed student activity.
Function - Further equilibration through broadening concrete experiences.

Although the Learning Cycle allows each student the opportunity to think for himself, the instructor must be an ever present "overseer" of the activity, and by providing probing questions, hints, and encouragement keep the activity going. Yet the instructor must guard against over playing his role as director and planner.

REFERENCES

Campbell, T.C.; Zucco, K. McGill, Phil; Taylor, K; and Thompson, R. The DOORS Project: Development of Operational Reasoning Skills. East Peoria, Ill.: Illinois Central College, 1979, Appendix.

Inhelder, B. and Piaget, J. The Growth of Logical Thinking From Childhood to Adolescence. New York: Basic Books, 1958.

Karplus, R. Science Curriculum Improvement Study. Teacher's Handbook. Berkeley, Calif.: University of California at Berkley, 1974.

SUGGESTED READINGS

Cowan, Philip. Piaget With Feeling: Cognitive, Social, and Emotional Dimensions. New York: Holt, Rinehart and Winston, 1978.

Elkind, David. Children and Adolescents. Oxford, New York: University Press, 1978.

Fuller, R.G. and Associates. Multidisciplinary Piaget-Based Programs for College Freshmen, 3rd ed. Lincoln, Nebraska: University of Nebraska, 1978.

Nader, Ralph. "Student Power 101." Change, 11 (8), 1979, 47-50. (Included because of his excellent examples of "hands-on" learning for college students.

Wadsworth, B.J. Piaget for the Classroom Teacher. New York: Longman, 1978.